

CLAIMS

We claim:

- 1 1. A method comprising:
2 validating a header of a packet from a first checksum of the packet;
3 decrementing a time-to-live field of the header;
4 recalculating a second checksum of the header;
5 performing a route lookup; and
6 forwarding the packet,
7 wherein the validating a header, the decrementing a time-to-live, the recalculating
8 a checksum, and the performing a route lookup are performed only once
9 for the packet during transfer within a router.
- 1 2. The method of claim 1, wherein the performing a route lookup further comprises:
2 determining a next-hop; and
3 determining an egress-port.
- 1 3. The method of claim 2, wherein the forwarding further comprises:
2 forwarding the packet in reference to the egress-port.
- 1 4. The method of claim 1, wherein the egress-port further comprises a local port on
2 the ingress-forwarding element, and the forwarding further comprises:
3 completing the encapsulation of the packet; and transmitting the packet over the
4 local-egress-port.
- 1 5. The method of claim 1, wherein the egress-port further comprises a remote port,
2 and the forwarding further comprises:
3 forwarding the packet to the egress-forwarding element through an internal bus of
4 the router;
5 applying a label that corresponds to the egress-port and next hop;
6 determining the next hop and the egress-port on which the packet is to be
7 transmitted in reference to the switch-label;

8 removing the label;
9 completing the layer-2 encapsulation of the packet; and
10 transmitting the packet over the egress-port.

1 6. A machine-accessible medium having associated instructions capable of directing
2 a machine to perform:
3 validating a header of a packet from the checksum of the packet;
4 decrementing a time-to-live field of the header;
5 recalculating a checksum of the header;
6 performing a route lookup;
7 determining an egress-port; and
8 forwarding the packet in reference to the egress-port of the packet,
9 wherein the validating action, the decrementing action and the recalculating
10 action are performed only once for the packet during transfer within a
11 router.

1 7. The machine-accessible medium of claim 6, wherein the egress-port further
2 comprises a local port on the ingress-forwarding element, and the forwarding further
3 comprises:
4 completing the encapsulation of the packet; and
5 transmitting the packet over the local-egress-port.

1 8. The machine-accessible medium of claim 6 wherein the egress-port further
2 comprises a remote port, and the forwarding further comprises:
3 forwarding the packet to the egress-forwarding element through an internal bus of
4 the router;
5 applying a label that corresponds to the egress-port and next hop;
6 determining the next hop and the egress-port on which the packet is to be
7 transmitted in reference to the switch-label;
8 removing the label;
9 completing layer-2 encapsulation of the packet; and

10 transmitting the packet over the egress-port.

1 9. A method to calculate of a routing table comprising:
2 determining the routing table from at least one routing update message; and
3 altering the routing table for each of a plurality of forwarding elements in the
4 router in reference to presence of an egress-port in the forwarding element.

1 10. The method of claim 9, the method further comprising:
2 determining the presence of an egress-port in the forwarding element.

1 11. The method of claim 9, wherein the altering further comprises:
2 adding a switch-label corresponding to an actual egress interface to the table,
3 when an egress-port is not present in the forwarding element, wherein the
4 switch-label is unique for every port/next-hop pair on the router.

1 12. The method of claim 9, wherein the altering further comprises:
2 performing no altering of the routing table for a forwarding element, when an
3 egress-port is present in the forwarding element.

1 13. A machine-accessible medium having associated instructions capable of directing
2 a machine to perform:
3 determining the routing table from at least one routing update message;
4 determining the presence of an egress-port in the forwarding element; and
5 altering the routing table for each of a plurality of forwarding elements in the
6 router in reference to presence of an egress-port in the forwarding element.

1 14. The machine-accessible medium of claim 13, wherein the altering further
2 comprises:
3 adding a switch-label corresponding to an actual egress interface to the table,
4 when an egress-port is not present in the forwarding element, wherein the
5 switch-label is unique for every port/next-hop pair on the router.

1 15. The machine-accessible medium of claim 13, wherein the altering further
2 comprises:

3 performing no altering of the routing table for a forwarding element, when an
4 egress-port is present in the forwarding element.

1 16. A method to switch at least one internal packet comprising:

2 applying a switch-label to at least one packet, wherein the switch-label uniquely
3 identifies a port/next-hop on the egress-forwarding element of a plurality
4 of forwarding elements that are operably coupled to each other through a
5 transfer connection; and wherein the transfer connection is selected from
6 the group consisting of a single bus, and a switched
7 backplane/interconnect; and
8 transferring the packet between the plurality of forwarding elements.

1 17. The method of claim 16, wherein the applying is performed by an ingress
2 forwarding element.

1 18. The method of claim 17, the method further comprising:

2 receiving the packet;
3 removing the switch-label from the packet;
4 completing layer-2 encapsulation of the packet in reference to an external
5 network; and
6 transmitting the packet, wherein the receiving, the removing, the completing and
7 the transmitting are performed by an egress-FE.

1 19. A machine-accessible medium having associated instructions capable of directing
2 a machine to perform:

3 applying a switch-label to at least one packet, wherein the switch-label uniquely
4 identifies a port/next-hop on the egress-forwarding element of a plurality
5 of forwarding elements that are operably coupled to each other through a

6 transfer connection; and wherein the transfer connection is selected from
7 the group consisting of a single bus, and a switched
8 backplane/interconnect; and
9 transferring the packet between a plurality of forwarding elements.

1 20. The machine-accessible medium of claim 19, wherein the applying is performed
2 by an ingress forwarding element.

1 21. The machine-accessible medium of claim 20, the method further comprising:
2 receiving the packet;
3 removing the switch-label from the packet;
4 completing layer-2 encapsulation of the packet in reference to an external
5 network; and
6 transmitting the packet, wherein the receiving, the removing, the completing and
7 the transmitting are performed by an egress-FE.

1 22. A system comprising:
2 a plurality of forwarding elements; and
3 a control element operably coupled to the plurality of forwarding elements,
4 further comprising a processor and a software means operative on the
5 processor for generating a switch-label table for each forwarding element.

1 23. The system of claim 22, wherein one of the forwarding elements further
2 comprises an egress forwarding element and another one of the forwarding elements
3 further comprises an ingress forwarding element, which receives packets from an external
4 networking environment, generates a local switch-label and associates the switch label
5 with the packet, the ingress forwarding element further comprises a packet forwarding
6 component that forwards the packet through the apparatus using the switch-label.

1 24. The system of claim 23, wherein the ingress forwarding element further validates
2 the packet header checksum, decrements the time-to-live indicator by one, and
3 recalculates the header checksum

1 25. A apparatus comprising:
2 a plurality of forwarding elements; and
3 a control element operably coupled through a switched interconnect/backplane to
4 the plurality of forwarding elements, further comprising a switch-label
5 table manager that generates a switch-label table for each forwarding
6 element.

1 26. The apparatus of claim 25, wherein one of the forwarding elements further
2 comprises an egress forwarding element and another one of the forwarding elements
3 further comprises an ingress forwarding element, which receives packets from an external
4 networking environment, generates a local switch-label and associates the switch label
5 with the packet, the ingress forwarding element further comprises a packet forwarding
6 component that forwards the packet through the apparatus using the switch-label.

1 27. The apparatus of claim 26, wherein the ingress forwarding element further
2 validates the packet header checksum, decrements the time-to-live indicator by one, and
3 recalculates the header checksum

1 28. The apparatus of claim 26, wherein the ingress forwarding element further
2 validates the packet header checksum, decrements the time-to-live indicator by one, and
3 recalculates the header checksum.

1 29. The apparatus of claim 25, wherein the control element further comprises a route
2 table manager that maintains a routing table.

1 30. The apparatus of claim 25, wherein the apparatus is a router.